USDA-FOREST SERVICE FS-2500-8 (6/06)

Date of Report: June 30, 2011

BURNED-AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST

A. Type of Report

[X] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

[ ] 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)

[X] 2. Interim Report
[ ] Updating the initial funding request based on more accurate site data or design analysis
[ ] Status of accomplishments to date

[ ] 3. Final Report (Following completion of work)

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: **Horseshoe 2**

B. Fire Number: AZ-CNF-011047

C. State: Arizona

D. County: Cochise

E. Region: Southwestern (3)

F. Forest: Coronado

G. District: Douglas

H. Fire Incident Job Code: P3F3KV

I. Date Fire Started: 05/08/2011

J. Date Fire Contained: **06/25/2011**

K. Suppression Cost: **$51,100,000 on 06/29/2011**

L. Fire Suppression Damages Repaired with Suppression Funds
1. Fireline waterbarred (miles): Handline - 40; Dozerline - 53
2. Fireline seeded (miles): 0
3. Other (identify): 0

M. Watershed Numbers: 150400060105, 150400060108, 150400060201, 150400060202, 150803010201

N. Total Acres Burned: **222,954** total acres, including fire use acreage on 05/22/2011
NFS Acres(**192,647**) Other Federal (**1,336 BLM; 12,163 NPS**) State (**2,874**) Private (**13,934**)

O. VegetationTypes:

Vegetation in burned areas includes mixed conifer, oak brush, pinyon pine, juniper, ponderosa pine and grassland ecotypes.

P. Dominant Soils:

Dominant Soils of the Coronado National Forest within the Horseshoe 2 fire perimeter (GES)

(476) - Lithic Ustochrepts, Typic Dystrochrepts, Typic Ustochrepts, and Granite/rhyolite rock outcrop; (475) - Lithic Ustochrepts, Typic Ustochrepts, and Granite/rhyolite rock outcrop; (381) - Lithic Ustorthents and Rhyolite rock outcrop; (148) - Typic Haplustalfs and Lithic Haplustalfs; (592) - Lithic Haplustolls, Lithic Calciorthids, and Limestone rock outcrop; (146) - Typic Haplustalfs and Aridic Haplustalfs; (370) - Fluventic Ustochrepts, Typic Ustifluvents, Typic Ustochrepts, and Riverwash; (452) - Typic Dystrochrepts, Dystric Cryochrepts, and Granite/Rhyolite rock outcrop; (490) - Aridic Ustochrepts, Typic Ustochrepts, Aridic Haplustalfs, and Typic Haplustalfs; and (371) - Fluventic Ustochrepts, Aquic Ustifluvents, Typic Ustifluvents, and Riverwash.

Dominant Soils of the Chiricahua National Monument within the Horseshoe 2 Fire Perimeter (Map Units)
(8) - Lithic Ustorthents, (22) - Aridic Ustorthents, (14) Aridic Ustorthents, (2) - Lithic Argiustolls and Lithic Ustorthents, (19) - Lithic Ustorthents, (23) - Aridic Haplustalfs and Lithic Haplustolls, (7) - Lithic Ustorthents, (12) - Lithic Ustorthents, (13) - Aridic Ustorthents, (15) - Aridic Ustorthents, (18) - Lithic Ustorthents, and several more with smaller proportions on the Chiricahua National Monument

Q. Geologic Types: Middle Miocene to Oligocene volcanic rocks including lava tuff, fine-grained intrusive rockand diverse pyroclastic rocks such as basalt, andesite dacite, rhyolite, diorite, granite, granodiorite, latite, trachyte, etc. Some conglomerate, sandstone, and sedimentaries are found in the southeastern portion of the fire perimeter.

R. Miles of Stream Channels by Order or Class:

Stream miles by order within Horseshoe 2 Fire Perimeter on **06/29**/2011.

Stream Order	Length (Miles)
1	**587**
2	**296**
3	**167**
4	**55**
5	**10**
Grand Total	**1114**

S. Transportation System

Trails: 175 miles Roads: 155 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres): **44,093** (unburned); **84,852** (low); **66,226** (moderate); **27,730** (high)
20% 38% 30% 12%

USFS – 35,243 unburned; 72,267 low; 59,762 moderate; 25,322 high severity
NPS – 1,921 unburned; 3,684 low; 4,478 moderate; 2,079 high severity
BLM – 490 unburned; 669 low; 171 moderate; 6 high severity
State – 1562 unburned; 717 low; 67 moderate; 1 high severity
State Wildlife Area – 28 unburned; 71 low; 220 moderate; 209 high severity
Private – 4,849 unburned; 7,444 low; 1,527 moderate; 113 high severity

B. Water-Repellent Soil (acres): (all high severity plus 45% of moderate severity)

C. Soil Erosion Hazard Rating (acres):
18,326 (low) 155,291 (moderate) 49,337 (high)

D. Erosion Potential: 29.18 tons/acre (estimate)

E. Sediment Potential: 69,277 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 3-7

B. Design Chance of Success, (percent): 80

C. Equivalent Design Recurrence Interval, (years): 5

D. Design Storm Duration, (hours): 0.5 hour

E. Design Storm Magnitude, (inches): 1.51 inches

F. Design Flow, (cubic feet / second/ square mile): 65 cfs/mi^2

G. Estimated Reduction in Infiltration, (percent): 57

H. Adjusted Design Flow, (cfs per square mile): 149 cfs/mi^2

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

The Horseshoe 2 fire burn area burned the majority of the Chiricahua Mountains and watershed surrounding the mountain draining in all directions where impacted. All of the watershed drain out to private land with some inclusions of state and other federal agency land. Almost every watershed drains to a ranch with associated infrastructure. The Cave Creek, East Turkey Creek and East Whitetail watersheds drain to more developed communities of Portal, Paradise and Whitetail, respectively. The watersheds are steep to very steep with a large majority fof the burn area over 50 percent slopes. The climate is very arid with an annual average rainfall of 12 to 19 inches. The Chiricahua Mountains experience some of the most intense monsoon rain events (very high rainfall rates in relatively short durations) in the United States. Vegetation in burned areas includes mixed conifer, oak brush, pinyon pine, juniper, ponderosa pine and grassland ecotypes.

Summary of Watershed Response

Hydrologic Response:
The site of the Horseshoe 2 fire has a bimodal precipitation pattern. The climate is heavily influenced by the North American monsoon, which delivers approximately fifty percent of the state's annual precipitation between the months of July and September. The second precipitation period occurs between November and April, providing about thirty percent of annual precipitation (Sheppard et al. 2002).

Based on historic precipitation patterns, it can be expected that high-intensity monsoon storms have a high probability of occurring in the coming weeks. These short duration, high intensity storms are associated with flash flooding and erosion events. These conditions will be exacerbated by the fire, creating hazardous

condition within and downstream of the burned area. Post-fire flows have the potential to be several orders of magnitude greater than pre-fire flow condition's.

In order to account for these exacerbated conditions the fire was divided into sub watersheds or "pour points." These pour points were located at the bottom for the 6th field watershed (where appropriate), at the burn perimeter, and where values at risk were located.

Pre and post-fire conditions were modeled using a 5-year 30 minute storm, which has a design storm magnitude between 1.24 and 1.56 inches. Estimated reduction in infiltration was based on the percentage of hydrophobic soil in the burn area. Pre-fire design flow was estimated at 64.78 cubic feet per second and post-fire design flow was estimated at 329 cubic feet per second. These values vary by watershed analysed and are described in detail along with the analysis method in the hydrology and watershed specialist report.

Erosion Response:
Soil textures range from gravelly loam to extremely cobbly sandy loam. Soils are generally shallow since geomorphic erosion rates are high, particularly in response to high severity wildfires. Dry ravel is a common form of chronic sediment transport in steep, arid, and semiarid environments where minimal ground cover exists to impede the movement of soil particles (Anderson et al., 1959; Krammes, 1965). Slopes range from 5 percent to as much as 120 percent. Ground cover, which is critical for maintaining soil stability, has been consumed in areas where high severity wildfire has occurred. Other areas exhibit low and moderate burn severities, which reduces the susceptibility of soils to erosion since some of the ground cover is retained. An assessment of burn severity found the overall soil burn severity to be 20 percent unburned/very low, 38 percent low, 30 percent moderate, and 12 percent high. Soils with low burn severity generally retain surface structure and porosity since fine roots remain intact and residual organic matter continues to cover soil surfaces and provide habitat for soil organisms that facilitate recovery of nutrient cycles. These soils generally respond rapidly and in a positive manner following low burn severity as revegetation occurs and soil surfaces regain protective cover. Soils that are subjected to moderate to high soil burn severities have evidence of excessive soil heating in isolated patches; these areas usually have long-term soil damage with increased erosion potential. The most severely burned areas generally occur on steep terrain at higher elevations where pre-fire vegetation density and fuels accumulations were higher. Water repellency, or soil hydrophobicity is present throughout the fire area but was most evident in higher burn severity areas. Low and moderate burn severities rarely exhibit hydrophobic conditions within the fire affected area.

Geologic Response:
The Chiricahua Mountains are located in the Basin and Range Province in southeastern Arizona. The Chiricahua Mountains contain a very diverse suite of rocks, however the rock units are mid-Tertiary sedimentary and volcanic rocks, including rhyolite, tuff, and andacite, emanating from two calderas within the range (Pallister and du Bray, 1992, 1994; Drewes, 1996). Other rock units include Proterozoic, Paleozoic, and Cretaceous metamorphic, sedimentary and volcanic rocks. The youngest units include Quaternary basalts and surficial deposits. Quaternary surficial deposits are composed of active stream channels and associated active and abandoned flood terraces, hillslope colluvial deposits and talus, debris-flow channels and associated deposits, and minor eolian deposits, mainly located on the west side of the range. The east side of the range drains into the San Simon Valley while the west side drains into the Wilcox basin and playa. Channels within canyons are confined, single-thread channels with have steep gradients, especially in the upper watersheds. Most of the channels emanating from canyons in the Chiricahua Mountains debouch onto broad alluvial fans at the base of the mountain. Beyond the apex of the fan, at the base of the mountain slope, the single-thread channels expand into numerous, multiple-thread channels. On the alluvial fans, channel gradients and confinement are significantly less than in the canyons and substantial deposition occurs. Flows across alluvial fans frequently migrate between channels depending on flood flows and sediment deposition.

Wildlife Response:
The area affected by the Horseshoe 2 Fire supports important habitats and occurrences of the following Federally Threatened and Endangered (T&E) fish and wildlife species: Yaqui chub (Federally Endangered), Yaqui catfish (Federally Endangered), Chiricahua leopard frog (Federally Threatened), Lesser long-nosed bat (Federally Endangered), Jaguar (Federally Endangered), Ocelot (Federally Endangered) and Mexican spotted owl (Federally Threatened) and designated Critical Habitat. Some of the above-mentioned species and their

habitats within the affected area have been affected by the fire and suppression activities. The habitats and species occurrences are at risk to further losses, disturbances, and habitat degradation from post-fire events. No emergency conditions exist for Jaguar and Ocelot or their habitat as a result of anticipated post fire effects.

There are concerns with post fire effects for aquatic species (Yaqui chub, Yaqui catfish and Chiricahua leopard frog) and their habitats. They are found in isolated pools in Upper Turkey Creek, Rucker Creek and/or Cave Creek watersheds. Post-fire impacts include reduced water quality and changes in water chemistry due to ash delivery; scouring of riparian/aquatic vegetation and changes in streambed/pool habitat due to debris flows and sediment delivery; flushing of species during flood events downstream. Floods, debris flows and sediment deposits may result in a temporary loss or reduction of suitable stream habitat. These small and isolated populations are at great risk of local extirpation as a result of post-fire conditions.

There is also a concern with post fire effects for the Mexican spotted owl (MSO). There are 14 MSO protected activity centers (PAC) that burned at various soil burn severities within the fire perimeter. Post fire impacts include further loss of old growth Douglas-fir trees within PACs from a prolonged bark beetle infestation. Douglas-fir with crown scorch greater that 30-50% have an 80-90% chance of bark beetle infestation (Allen et al. 2006). The Horseshoe 2 Fire burned about 74% of the Chiricahua mountain range. This significantly reduced the amount of suitable breeding habitat in PACs. The loss of additional old growth Douglas-fir trees in PACs would adversely impact the MSO population that currently exists in the Chiricahua mountain range. A further reduction in the size of these mixed-conifer patches or in the abundance of large Douglas-fir trees within the patches could cause significant population decrease. Since large Douglas-fir trees, high basal areas, and dense canopies are basic components needed for MSO reproduction, it would take a minimum of 100 years for the habitat to become suitable again.

Heritage:

Post-fire soil conditions have the potential to directly or indirectly impact heritage resources within the Horseshoe Two Burn area. Threats include: the development of rills and gullies which can expose and remove cultural deposits; increased levels of sheet wash which can erode or bury archaeological deposits, as well as threaten intact, standing structures; fire-killed trees which can fall on existing features, as well as up-end root structures which can collapse structural features or expose buried artifacts and other materials.

Values at Risk:

*The risk matrix below, Exhibit 2 of Interim Directive No.: **2520-2010-1**, was used to evaluate the Risk Level for each value identified during Assessment. Only treatments that had a risk of Intermediate or above are discussed below, but all values at risk are included in the Tables in the Appendix. Additionally more information on the values at risk by watershed that are driving treatments can be found in the appendix.*

Probability of Damage or Loss	**Magnitude of Consequences**		
	Major	Moderate	Minor
	RISK		
Very Likely	**Very High**	**Very High**	**Low**
Likely	**Very High**	**High**	**Low**
Possible	**High**	**Intermediate**	**Low**
Unlikely	**Intermediate**	**Low**	**Very Low**

Life:

Road/Stream crossings

There are multiple road/stream crossings within and immediately downstream of the burn area. Post-fire flows are predicted to be from 2 to 15 times greater than pre-fire flows for a 5 year, ½ hour rainfall event.

Risk Assessment – Threats to travelers on Forest Roads

Probability of Damage or Loss: Possible. Low water crossings/flash flood risk.

Magnitude of Consequence: Moderate. Possible injury of both administrative users and Forest visitors.

Risk Level: Intermediate – treatment considered for threats to human life or safety. Seasonal closure, gates to control access and warning signs

Primary residences at mouth of canyons

There are houses at the mouth of almost every watershed around the burn. The majority of these homes are primary residences and the rest of the homes are typically inhabited in the summer (monsoon) months for birding.

Risk Assessment – Threats to homeowners

Probablity of Damage or Loss: Possible to Likely – risk from flooding greatly increased and history of past flooding

Magnitude of Consequence: Moderate – possible injury

Risk Level: Intermediate to Very High – no feasible hillslope treatments (too steep), channel treatments would not be effective for the predicted flows – coordinate with NRCS so that they can address specific landowner needs and ADWR/ADEM/USGS to address potential for early warning systems.

Campgrounds near stream channel

There are several campgrounds on the District within, or downstream of the burn area that are at increased risk of flooding and debris flows.

Risk Assessment – Threats to Forest users

Probablity of Damage or Loss: Likely – risk from flooding/loss of water control

Magnitude of Consequence: Moderate – possible injury

Risk Level: High – consider treaments – seasonal closure and warning signs

Org. camp near stream channel

There is a organization special use agreement for a Methodist (Church) camp on National Forest System land on the District within the burn area that is at increased risk of flooding and debris flows. Additionally the only in/out access on FS RD 42C crosses the main channel of Pine Creek

Risk Assessment – Threats to camp users

Probablity of Damage or Loss: Very Likely – in canyon bottom below high soil burn severity areasd - risk from flooding/loss of water control

Magnitude of Consequence: Major – potential loss of life

Risk Level: Very High – Hillslope treatments will not work as there is too little treatable slope (too steep) and channel treatments would be over welmed – recommend closure/shut down of the camp until the watershed recovers

Hazardous Materials

FS administrative sites and a few recreation (special use) residences on National Forest land burned in the fire. There is potential hazardous materials that could be mobilized in rainfall events and /or associated flows.

Risk Assessment – Threats to Forest users and downstream landowners

Probablity of Damage or Loss: Possible - high severity steep slopes above but has a slight buffer/risk from over land flow

Magnitude of Consequence: Major - Possible Haz Mat and possible damage to structure left after fire

Risk Level: High – Containment of haz mat material (tacifier) and haz mat waddles/K-Rails around sensitive buildings/if no haz mat then no treat for hazmat

Forest users on trails and at burned lookout

FS trails exist throughout the burn area and there is a risk to users from increased runoff and hazard trees.

Risk Assessment – Threats to Forest users

Probablity of Damage or Loss: Likely - severity of burn

Magnitude of Consequence: Moderate - injury, wash out of trail and burnt out open well

Risk Level: High – Trail closure, cap cistern and pit toilet

Property:

Forest Service roads

FS roads exist throughout the burn area (especially in Upper Turkey Creek, Rucker Canyon, Cave Creek, East Turkey Creek and Pinery Canyon watersheds) and there is a risk to the roads and crossings from increased runoff, associated sediment and debris and debris flows.

Risk Assessment – Threats to Forest Roads

Probablity of Damage or Loss: Likely – multiple crossings and parallel sections in the floodplain

Magnitude of Consequence: Moderate – water could channel down road with possible wash outs and there is a potential for crossings to be damaged or destroyed.

Risk Level: High to Very High– Install rolling dips, drainage structures and implement Storm Inspection and Response. In one case (FS356), gabion baskets to keep road from washing out during high flows. In another case (FS 42 above SW Research Station) remove the culvert array and replace with a low water crossing.

Primary residences at mouth of canyons

There are houses at the mouth of almost every watershed around the burn. Many of the ranches have a significant amount of associated infrastructure.

Risk Assessment – Threats to private property (homes and infrastructure)

Probablity of Damage or Loss: Possible to Likely – risk from flooding greatly increased and history of past flooding

Magnitude of Consequence: Moderate – possible innundation of structures and damage to outbuildings and corrals.

Risk Level: Intermediate to Very High – no feasible hillslope treatments (too steep), channel treatments would not be effective for the predicted flows – coordinate with NRCS so that they can address specific landowner needs.

Watering systems (metal tanks, wells, pipelines and troughs)

There are several water system structures around the burn on both private land and NFS land. Access to water is most often in drainages sothe majority of these systems and infrastructure are in, or near, the channels.

Risk Assessment – Threats to Water systems and infrastructure

Probablity of Damage or Loss: Possible – Located on terrace above road/Risk from Increased Sedimentation/Flooding at wells

Magnitude of Consequence: Moderate – Sediment could fill well/Well could have to be re-drilled

Risk Level: Intermediate– for the NFS water structures sandbags around the systems at risk.

Forest users on trails and at burned lookout

FS trails exist throughout the burn area and there is a risk to users from increased runoff and hazard trees.

Risk Assessment – Threats to Forest users

Probablity of Damage or Loss: Likely - severity of burn

Magnitude of Consequence: Moderate - wash out of trail and burnt out open well

Risk Level: High – Trail stabilization where there is the potential to damage the train tread or washout ephemeral stream crossings

Forest Campground and Picnic area facilities

Some fo the infrastructure associated with several of the FS campgrounds is at risk from increased post-fire flooding and debris flows.

Risk Assessment – Threats to Forest facilities

Probablity of Damage or Loss: Likely - severity of burn in watershed above campground and proximity to drainage.

Magnitude of Consequence: Moderate – loss of property

Risk Level: High – move picnic tables, bear boxes and other floatable structures up hill away from the drainages during closures; divert runoff around immovable structures

Forest Service administrative

Some of the infrastructure associated with the FS administrative site in Upper Pinery Canyon is at risk from increased post-fire flooding and debris flows.

Risk Assessment – Threats to Forest facilities

Probablity of Damage or Loss: Likely – increased flood risk to structures and low water crossing which is the only access to the site.

Magnitude of Consequence: Moderate – some flood damage

Risk Level: High – two jersey barriers around the well house to protect the structure

Utility lines on NFS property

Some of the infrastructure associated with the FS administrative site in Upper Pinery Canyon is at risk from increased post-fire flooding and debris flows.

Risk Assessment – Threats to utility lines (poles)

Probablity of Damage or Loss: Possible– increased flood risk to structures.

Magnitude of Consequence: Moderate – some flood damage

Risk Level: Intermediate – no treatment from FS – coordinate with power companies

Natural Resources:

Soil Productivity/Watershed Functioning/Water Quality

Areas burned at high severity, and some burned at moderate severity without the potential for needle cast are at elevated risk of soil erosion and degradation of watershed function.

Risk Assessment – Threats to soil productivity and watershed functioning

Probablity of Damage or Loss: Likely– based on burn severity and lack of potential ground cover.

Magnitude of Consequence: Moderate – erosion hazard is elevated from burn severity and increased post-fire erosion. Grazing on recovering slopes would set back recovering and prolong elevated erosion.

Risk Level: High – aerial seed large contiguous areas of high burn severity and remove grazing for the first growing season (to be reevaluated prior to next season)

Native Plant community

Suppression efforts may have introduced non-native invasive species into the burn area with the potential to impact native plant communities. There were no or very minimal non-native invasive plants in the Chiricahua Mountains prio r to the fire

Risk Assessment – Probability of damage or loss of the native plant community

Probablity of Damage or Loss: Likely - Based on burn severity, miles of dozer line, and other suppression activities.

Magnitude of Consequence: Major – loss of native plants communities.

Risk Level: Very High – invasive species detection surveys following monsoon and winter precipitation

Mexican Spotted Owl Protected Activity Centers

All of the MSO protected activity center (PACs) in the Chiricahua Mountains were burned at varying severity in the fire. Areas of low and moderate burn severity are now at risk from bark beetle invasion. The loss of the remaining large Douglas-fir and other mixed conifer would result in loss of most of the MSO habitat in the range

Risk Assessment – Probability of damage or loss of MSO PAC habitat

Probablity of Damage or Loss: Very Likely - possible invasion/increase of bark beetles to PAC, based on what has occurred in the area before.

Magnitude of Consequence: Moderate - would only impact this mountain range.

Risk Level: Very High – MCH application to old growth Douglas-fir in PACs to drive off bark beetles from the PACs to limit damage to mature trees

Water Quality

The location of the picnic area/campground (Idlewilde, Stewart, South Fork and Sunny Flat) pit toilets make them susceptible to post-fire flooding. There is the potential to introduce contaminents (fecal matter) into the streams.

Risk Assessment – Probability of introducing fecal matter into the watershed

Probablity of Damage or Loss: Likely - based on expected flows.

Magnitude of Consequence: Moderate – potential downstream contamination.

Risk Level: High – Pump pit toilets and close to avoid potential contamination.

Water/Soil Quality

Burned buidlings (admin and recreation residences) have potential hazardous materials in them. This material is susceptible to erosion and movement offsite fro rainfall and increased storm flows.
Risk Assessment – Probability of off-site contamination

Probability of Damage or Loss : Possible - high severity steep slopes above but has a slight buffer/risk from over land flow

Magnitude of Consequence: Major - Possible Haz Mat.

Risk Level: High – Containment of haz mat material (tacifier) and haz mat waddles/K-Rails around sensitive buildings/if no haz mat then no treat for hazmat.

Endangered aquatic species (Yaqui chub, Yaqui Catfish, Chiricahua Leopard Frog)

Risk Assessment – Probability of effects on habitat

Probability of Damage or Loss : Likely - Impact from high flows and increased sediment / loss of habitat/ change of stream morphology

Magnitude of Consequence: Major - Loss of habitat/species

Risk Level: Very High – Fish Relocation - Non-FS, fish and wildlife is heading the relocation, considered hill slope treatments determined that short/long term effectiveness as low and not cost effective

Cultural Resources:

Historic Homestead

Risk Assessment – Probability of damaging remaining structure

Probability of Damage or Loss : Likely - below steep slope with high severity

Magnitude of Consequence: Moderate - potential for damage to site

Risk Level: High – Place straw waddles around the site to re-direct overland flow away from the site and contain artifacts within the perimeter of the site

Risks: The full list of values at risk is included in the appendix and the VARs are listed by watershed.

B. Emergency Treatment Objectives:

As noted above, threats to life, property, and natural and cultural resources from loss of water control, increased sediment delivery, increased debris flow potential, establishment of noxious weeds, and habitat degredation for Federally Endangered and Threatened species exist as a result of the Horseshoe 2 Fire. For these reasons the primary treatment objectives are:

- Mitigate effects changed post-fire watershed response on human life and safety, particularly where Forest roads, bridges, and cross drainages are at risk of damage and where flash flood, debris flows present a hazard to recreationists (hikers and equestrian trail users).
- Mitigate effects of changed post-fire watershed response on Forest Service develodped sites such as campgrounds and administrative sites.
- Mitigate effects of changed post-fire watershed response on the historic properties and cultural resources.
- Mitigate effects of changed post-fire watershed response on natural resources such as Federally listed Mexican Spotted Owl, and Yazui Chub (Endangered fish).
- Minimize the increased potential for the spread of invasive and noxious weeds.
- Mitigate effects of changed post-fire watershed response on long-term soil productivity and hydrologic function.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land **70** % Channel **N/A** % Roads/Trails **75** % Protection/Safety **90** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	75	90	80
Channel	75	80	90
Roads/Trails	80	85	95
Protection/Safety	85	90	95

E. Cost of No-Action (Including Loss): Critical values would be lost. See critical value list above. $754,630. Total value of the bridges is estimated at $3,100,000. The risk of damage for these bridges is rated at “very likely”, or >90% chance of happening. Cost of the no action is $2,790,000.

For interim #1 reference the VAR Tool Spreadsheet in a separate document

F. Cost of Selected Alternative (Including Loss): There remains a 20% chance that the proposed treatments for this initial work may not succeed. Total cost of the action alternative plus this 20% chance of failure is $754,630.

For interim #1 reference the VAR Tool Spreadsheet in a separate document

G. Skills Represented on Burned-Area Survey Team:

[x] Hydrology	[x] Soils	[X] Geology	[x] Range
[x] Forestry	[x] Wildlife	[ ] Fire Mgmt.	[x] Engineering
[ ] Contracting	[ ] Ecology	[X] Botany	[x] Archaeology
[X] Fisheries	[ ] Research	[ ] Landscape Arch	[x] GIS

Team Leader: Marc Stamer and Tedd Huffman

Email: mstamer@fs.fed.us / elhuffman@fs.fed.us Phone: 909.844.6683 / 304.940.5469

Core Team Members:

- Ann Youberg – Geomorphologist
- Kit MacDonald – Soil Scientist
- Chris Stewart – Hydrologist
- Kyle Wright – Hydrologist
- Jalyn Cummings – Hydrologist
- Adam Springer - Hydrologist
- John Hutchison – GIS
-
- Angelica Mendoza – Wildlife/Fisheries
- Erica Tarbox – Roads Engineer
- Luke Kellett – Heritage
- John Hoffman – Heritage
- Michael Bryk – Heritage
- Ed Holloway – Range/Botany
- Sharon Biedenbender – Botany
- Mike Johnson - Information

H. Treatment Narrative:

Interim 1 Treatment Request

Note: The treatment descriptions below are summarized. Treatment specification sheets are included as part of the project file.

The proposed treatments on National Forest System lands can help to reduce the impacts of the fire, but treatments will not completely mitigate the effects of the fire.

The treatments listed below are those that are considered to be the most effective on National Forest System lands given the local setting including topography and access.

Land Treatments:

No land treatments at this time. There will be more assessment in the near future, and perhaps land treatments will be added at that time.

Interim 1 Treatment Request

Invasive Plants: Forest Service policy mandates the Forest to minimize the establishment of non-native invasive weeds to prevent ecosystem degradation of burned areas. Fire fighting vehicles and equipment are common vectors that spread invasive weeds. There is a high likelihood that suppression activities on the Horseshoe 2 Fire have vectored weed seed into the burned area because vehicles and equipment were not washed prior to entering the fire area, some vehicles and equipment originated in areas with weed infestations, and there are known weed infestations on roads and private land near the fire. Malta starthistle has been documented at the Ash Creek Incident Command Post. Most of the burned area does not have known invasive weed infestations. If new infestations are established, the magnitude of the consequences could be significant and long-term. An Early Detection Rapid Response strategy to monitor for weed infestations and treat small infestations, providing survey time is not compromised, is proposed.

Areas disturbed by the Horseshoe 2 Fire and associated suppression and rehabilitation activities are highly vulnerable to invasive weed invasion. These include roads, trails, hand line, dozer line, staging areas, safety zones, helicopter drop points and riparian areas at road crossings. If weeds are detected during the surveys, an interim request for treatment will be requested.

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Crew Cost	**Days**					
Supplies*	**Lump Sum**					
Travel/Perdiem	**Days**					
TOTAL						

*supplies include, but are not limited to, GPS units, hand tools, safety equipment, plastic bags and herbicide

Aerial Seeding: The Horseshoe 2 fire has the potential for some degree of soil erosion resulting in loss of soil productivity. To help combat this potential issue, aerial seeding using fixed winged airplanes will be conducted in areas of moderate to high fire severity to help hold the soil. Approximately 5680 acres on National Forest across areas that burned with moderate or high severity and varying soil types have been evaluated and determined suitable for seeding treatment to protect soil productivity. Areas to be treated will be located on a treatment map and also in a GIS file, which can be given to the contractor. See treatment specification sheet for detailed information.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Contract	**Acre**					

FS	Acre					
TOTAL COST						

Heritage Site Stabilization: Based on field review and determinations of increased hillslope erosion, the BAER Assessment Team determined there was high potential for damage to the site. The hazard can be mitigated by installing straw wattles on the hillslope above the arch site to capture sediment and reduce the potential for damage to the site.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Crew Cost	Day					
Materials/Supplies	Lump Sum					
Travel	Miles					
TOTAL						

Channel Treatments:

The goal of the stream channel treatments is to bring channels to more appropriate dimensions and selectively remove encroached trees and woody debris to minimize in-stream debris racks or dams, thereby improving channel flow and sediment and debris transport under bridges. Coarse woody debris in stream channels will be removed from channels or sawn to shorter lengths to allow passage of material under bridges, thus preventing debris racks that can inhibit or divert channel flow.

1. Stewart Bridge

This bridge is located in the Cave Creek drainage. A large amount of sediment has been deposited under one side of the bridge, causing stream flow to pass under the other side of the center column and reducing the area through which flood flows can pass under the bridge. This sediment deposit will be excavated from beneath the bridge to increase the cross sectional area under the bridge to accommodate expected flood flows and restore the channel shape and function as it relates to the bridge.

A large gravel/cobble bar has been deposited approximately 75 feet upstream of the bridge as a result of previous flooding events. Several trees of various sizes have encroached on this bar and a large, dead Arizona cypress (approx. 28 in DBH) located on the bar is extremely decadent and at risk of falling. Large amounts of sediment have also been deposited along the outside curve of the channel between the bar and streambank, decreasing the channel capacity.

Trees, including the dead cypress will be selectively removed from the bar to prevent debris racks. The situation is such that these trees, growing on a gravel in the middle of the channel, will trap logs, branches, gravel until they themselves are uprooted, releasing a sudden flood of water, logs, and gravel.

2. Sunny Flat Bridge

The channel of Cave Creek has aggraded throughout much of this reach due to increased deposition of eroded material from previous flooding events. A large gravel/cobble bar has formed in the channel immediately below the bridge. Trees have encroached on this bar and are causing debris racks to form. Bank scour is occurring immediately above the bridge on the bank closest to the Sunny Flat Campground.

The stream channel will be excavated to a depth of approximately 2 feet for 150 feet above and 150 feet below the bridge to increase channel capacity through this reach. Trees will be selectively removed from the bar to minimize debris rack formation. To prevent flood waters from entering the Sunny Flat

Campground, excavated material will be deposited on the edge of the stream bank and used to protect the streambank where scour is occurring.

3. Cazier Bridge
Approximately ½ (25 ft.) of the channel width of Cave Creek has excessive sediment and debris deposited under the bridge. This effectively reduces the cross sectional area through which expected stormwater can flow. These materials will be excavated to to a depth of 2 feet immediately below the bridge and extending 20 feet upstream and 20 feet downstream of the bridge to increase the volume of water that can pass under the bridge.

4. In-Stream Large Woody Debris Removal (Stewart Bridge, Sunny Flat Bridge, Cazier Bridge, Idlewidle Bridge, South Fork Bridge, and Upper South Fork Bridge)
Large woody debris (i.e. tree boles) was found in Cave Creek and South Fork Cave Creek. This debris has the potential to float downstream and collide with bridges and scour streambanks during flooding events. As floating debris collects in a give area, the resulting debris dam can inhibit flood flow causing streams to exceed their banks, resulting in overland flooding.

Large woody debris in channels of Cave Creek and South Fork Cave Creek will be removed from the channels and placed in upland locations or sawn to lengths of less than 5 feet to minimize debris dams and obstruction of bridged crossings, and decrease mass that would impact bridge structures.

Interim 1 Treatment Request
No Channel Treatments Requested

Road and Trail Treatments:

1. Road and Low Water Crossing Stabilization and Hardening of the Road Fill (Flood Proofing)
The need for these treatments will be further evalutated and if needed will be described at a later date.

2. Road Blading / Resurfacing
The need for these treatments will be further evalutated and if needed will be described at a later date.

3. Trail Stabilization
The need for these treatments will be further evalutated and if needed will be described at a later date.

4. Storm patrol:
The need for these treatments will be further evalutated and if needed will be described at a later date.

Interim 1 Treatment Request
Road Stabilization Treatments: The severity of burn in watersheds, combined with road location, high possibility of flash flooding and debris flow has increased the risk to road users. The purpose of these treatments is to increase roadway stabilization to pass large water flows and associated bedload. Protect road template from increased flows and decrease the chances of washing road fill into adjacent drainage structures and flow channels. Dips and low water crossings will be placed down stream from culverts with high potential for failure. In situations where placement of rolling dips or low water crossing is not feasible the culvert will be replaced. The replaced culverts will be upsized to manage the increased flows.

Due to the potential threat for public safety within the fire area the BAER Assessment Team recommends the a closure to vehicle traffic on the roads listed in the following table.

Forest Service Roads Suitable for Treatment			
41	42	255	314
317	356	357	42 A
42 B	42 C	42 D	42 E (622)
4222	4286	4288	4322
74	74 E		

Roadway warning signs and gated closures will be installed to protect life until the Forest can review the vegetative recovery and determine the watershed emergency has been mitigated by vegetative recovery.

Specification Cost Summary Sheet

LINE ITEM	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Construction Cost	Miles					
Personnel Cost	Days					
Materials/Supplies (Rip/Rap, Gravel)	CY					
Travel/Perdiem	Lump Sum					
Total						

Storm Inspection and Response: Roads within the Horseshoe 2 Fire contain drainage structures that cross streams located in watersheds that have a high to moderate burn severity. These streams now have the potential for increased runoff and debris flows. These increases in flows pose a threat to the existing crossings which may result in plugging drainage structures or exceeding their maximum flow capacity. If these flows plug drainage structures the result could be massive erosion and debris torrents further down the drainage due to the failure.

Also, there is an immediate and future threat to travelers along these roads within the burned area due to the increased potential for rolling and falling rock from burned slopes and increased potential for flash floods and mudflows. With the loss of vegetation normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely that this runoff will cover the roads or cause washouts. These events make for hazardous access along steep slopes and put the safety of users at risk.

The patrols are used to identify those road problems such as plugged culverts and washed out roads and to clear, clean, and/or block those roads that are or have received damage. The storm patrollers shall have access to at least a backhoe and dump truck that can be used when a drainage culvert is plugged or soon to be plugged and to repair any road receiving severe surface erosion.

Work should be performed in the morning and early afternoon. Leave drainages when chance of rain is moderate or higher. Store equipment and materials out of flood plains and where chance of loss is low.

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Storm Patrol	Days					
Travel Perdiem	Days					
Total Cost						

Trail Stabilization Treatments and Closure: This treatment will reduce the potential for increased watershed degradation caused from the effects of cascading failures of trail structure, and reduce the potential of fatalities or injuries along Forest system trails. With the burned condition of the slopes adjacent to the certain sections of the trails, storm runoff is likely to increase and concentrate onto the trails. Considering the existing conditions found on the trails surveyed as described in this report, moderate to possibly severe trail damage and some off-trail erosion/sediment delivery to channels is likely to occur along identified sections of the trails with vulnerable conditions. Trail incision and complete loss of trail tread could occur, therefore resulting in loss of trail infrastructure possibly leading to significant repairs and costs to restore sections of trail. Loss of water control will lead to off-trail slope erosion and gully formation. Once active gullies are developed, gullies will continue to erode during each storm event and contribute to downstream sedimentation and trail instability. Recommended treatments will include installation of waterbars, low water crossings, and removal of berms.

Due to the potential for injury to trail users in the burn area from debris flow and flash flood potential, the BAER Assessment Team recommends the closure of system trails within the burn area. Signs to implement this closure were order as part of the initial request.

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Crew Cost	**Miles**					
Supplies	Miles					
Travel Perdiem	Miles					
Total Cost						

Interagnecy Coordinator: Throughout the monsoon season and the following winter, the Forest should continue coordinating with cooperating agencies, relaying the BAER Assessment findings, and providing input as rain events are predicted.

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Personnel Cost	Days					
Travel Perdiem	Days					
Total Cost						

Protection/Safety Treatments:

1. **Flash Flood and Falling Debris Hazard Warning Signs for Roads, Trails, and Campgrounds; Area Closed signs.**

Flash flood hazard warning signs and falling debris hazard signs will be installed at targeted locations on roads, trails, and campgrounds. These locations are ingress areas of roads, trails and campgrounds that either cross drainages or are located in low-lying areas adjacent to drainages and are at risk of flash flooding due to fire effects. These signs are necessary to inform forest users of immediate danger posed by storm-related response to fire effects and hazards within burned areas (floods, snags, loose rock, etc.).

In addition, some areas will have to be closed because public safety cannot be provided for.

Fifty road warning signs, 25 area closed signs, and 100 trail warning signs are anticipated. This treatment is expected to provide protection of human life and safety.

Interim 1 Treatment Request

Mexican Spotted Owl (MSO) Habitat Protection: The purpose of this treatment is to treatment fire stressed old growth Douglas-fir habitat within MSO PACs with the bark beetle anti aggregation pheromone, 3-methylcyclohex-2-en-1- one (MCH). This treatment will likely result in protection of Mexican spotted owl old growth habitat within their protected activity centers from further loss. Large, old-growth mixed conifer trees are important habitat components for MSO. Large trees within MSO PACs were damaged, but not killed during the fire. These large trees can be highly susceptible to attack by Douglas-fir beetle within the first two years following the fire. Where such susceptible trees are abundant, beetle populations can build up rapidly and spread to adjacent non-damaged stands. There have been several documented cases of Douglas-fir beetle reaching outbreak status following fire scorch damage to Douglas-fir (See Wildlife Specialist Report).

The application of the Douglas-fir beetle anti-aggregation pheromone, MCH, will minimize the risk of further

reduction of MSO habitat within PACs. This is important due to the fact that all of the PACs in this mountain range were affected by the fire. MCH is effective because it serves to disrupt aggregation behavior of beetles. MCH has been used operationally to protect localized areas from being attacked by Douglas-fir beetle. If additional years of treatment are recommended by a Forest Health specialist, an interim request may be submitted for additional funding.

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Crew Cost	**Hours**					
Supplies	Each					
Travel Perdiem	Miles					
Total Cost						

Open Pit Hazard Treatment: The pit toilet and the cistern associated with the Barfoot lookout were both burned during the fire, resulting in two open pits. The open pits are currently a falling hazard to people and wildlife species. To increase public safety at the destroyed Barfoot lookout the BAER assessment team recommends both open pits are temporarily covered with lids.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Crew Cost	**Employees**					
Supplies	**Lump Sum**					
Travel/Perdiem	**Miles**					
TOTAL						

Protection of Government Property: The purpose of the treatment is for the protection of government property (Table 1) that would be damaged by floods and debris flows if no action was taken. The treatment consists of the installation of jersey barriers, sandbags, and backfill around structures at risk from flood and debris flows. Barriers are to be keyed into existing slopes or be placed so that flows cannot travel around the established barriers. The barriers should also be buried a minimum of one foot underground surface and well compacted. All barriers shall be connected and interlocked to prevent movement of barrier. Sand bags are to be placed between the jersey barriers and protected structure to provide for barrier reinforcement and stabilization. Additional sandbags are to be used to assist with structure protection and the water development in Horseshoe canyon. Refer to the engineering specialist report for more detail.

Table 1. Government Property at Risk

Forest Service Property	Drainage
Sycamore Campground	Upper Turkey Creek
Rustler Park Admin Site	East Turkey
Pinery Admin. Site and Associated well head	Upper Pinery
Water System Protection	Horseshoe Canyon

Work should be performed in the morning and early afternoon. Leave drainages when chance of rain is moderate or higher. Store equipment and materials out of flood plains and where chance of loss is low.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Personnel Cost	Lump Sum					
Materials	Lump Sum					
Travel/Perdiem	Lump Sum					
Contractor Cost	Lump Sum					
TOTAL						

Hazardous Material Stabilization: The purpose of this treatment is to reduce the possibility of hazardous materials contaminating streams and soils during a post fire rain event. There are several areas of concern in regards to soil and stream contamination with hazardous materials because of the expected post fire watershed response in those areas. Two recreational residences burned in Upper Turkey Creek watershed between Forest Road 41 and Turkey Creek, one admin site burned in East Turkey Creek watershed, and two others in East Turkey Creek watershed. There is a possibility that toxic chemicals (such as asbestos and lead paint) can easily mobilize from these sites and contaminate the soil and stream. Stabilization measures are recommended to reduce this risk. Water deflecting barriers and hazardous material socks would reduce the risk of flooding and movement of hazardous material. Federally Endangered Yaqui chub, Yaqui catfish and Chiricahua leopard frog are found downstream of the hazardous materials sites in Upper Turkey Creek.

An old Forest Service admin site also burned in the Cave Creek watershed. Toxic chemicals (such as asbestos and lead paint) can easily mobilize from these sites and contaminate the soil and stream. Stabilization measures are recommended to reduce this risk. There are approximately 5 toilets within the floodplain in Cave Creek watershed. Expected post fire watershed response has possibility of flooding the toilets and causing soil and stream contamination. It is recommended that septic tanks and vault toilets be pumped to reduce the potential of sewage being released into the streams. Federally Endgangered Chiricahua leopard frog occurs downstream of the hazardous material in Cave Creek.

The Forest should continue to expedite removal of hazardous materials.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Personnel Cost	Days					
Materials	Lump Sum					
Travel/Perdiem	Miles					
Contractor Cost	Lump Sum					
TOTAL						

I. Monitoring Narrative:

Seeding effectiveness

- Utilize existing range utilization plots and methodology to monitor seed germination soon after the start of monsoon rainfall, approximately 2-3 weeks after seeing. Continue with monitoring of percent ground cover by species in the fall after the first growing season and again in the spring after winter precipitation. During the cover monitoring assess the amount of rilling and interrill erosion.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Personnel Cost	Days				H3F3KV	
Materials	Lump Sum					
Travel/Perdiem	Miles					
TOTAL						

Closure effectiveness – Life/Soil Productivity

- Patrol the burn area to assess the effectiveness of the administrative closure in keeping people and vehicles out of the burn area, out of the drainages and off trails when hazards present themselves and the Forest maintains an administrative closure. Also patrol areas where there is the potential for trespass livestock from private land to enter the National Forest. Arizona is a fence out (free range) state so it is important for the Forest to provide for limitations to access to the Forest by livestock to ensure the area is given adequate time to recover vegetatively after the fire, esp. in high and moderate burn severity.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Personnel Cost	Days				H3F3KV	
Materials	Lump Sum					
Travel/Perdiem	Miles					
TOTAL						

Road stabilization

- Monitor the effectiveness of the proposed road stabilization treatments at diverting water off the roads. This will be most important during, or after, storm inspection and response which will be done after storm events on the burn area. This monitoring can be done by the roads crew after the inspection and/or response phase.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Personnel Cost	Days				H3F3KV	
Travel/Perdiem	Miles					
TOTAL						

MSO pheromone treatment effectiveness

- In the areas where the pheromone treatments are implemented assess the level of mortality in mature Douglas-fir that were only burned at low and moderate severity. This can be done in conjunction with the Forest Health Management/Forest Inventory Analysis inventory crews or by Enterprise crews.

SPECIFICATION COST SUMMARY

Line Item	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
Personnel Cost	Days				H3F3KV	
Travel	Miles					
Perdiem	Days					
TOTAL						

Long Term Level 3 Monitoring recommendations

Debris flow modelling

-

Part VI – Emergency Stabilization Treatments and Source of Funds

			NFS Lands				Other Lands			All
		Unit	# of		Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER $	$	units	$	Units	$	$
A. Land Treatments										
Heritage site protection/stabilizatio	***site***									
MSO PAC protection	***acre***									
Weed detection	***days***									
Aerial seeding	***acres***									
Subtotal Land Treatments										
B. Channel Treatments										
Channel Tmts at Bridge	each									
Bridge excavation work	cu. Yds.									
Large Woody Debris Removal	miles									
Subtotal Channel Treat.										
C. Road and Trails										
Road Stabilization and Closure	***miles***									
Storm Inspection and Response	***days***									
Trail Stabilization and Closure	***miles***									
Subtotal Road & Trails										
D. Protection/Safety										
Install hazard signs for roads	each									
Install "area closed" signs	each									
Install hazard signs for trails	each									
FS structure protection	***each***									
Interagency Coordinator	***day***									
FS water system protection	***each***									
HazMat stabilization	***each***									
Subtotal Structures										
E. BAER Evaluation										
Assessment										
Subtotal Evaluation										
F. Monitoring										
Seeding effectiveness	***trips***									
Closure effectiveness	***trips***									
Road stabilization effectiveness	***trips***									
MSO pheromone efefctiveness	***trips***									
Subtotal Monitoring										
G. Totals										
Previously approved										
Total for this request										

PART VII - APPROVALS

1. /s/ Jim Upchurch — 6/30/2011
   Forest Supervisor — Date

2. /s/ _____ — 7/1/2011
   Washington Office — Date